

FIG. 1

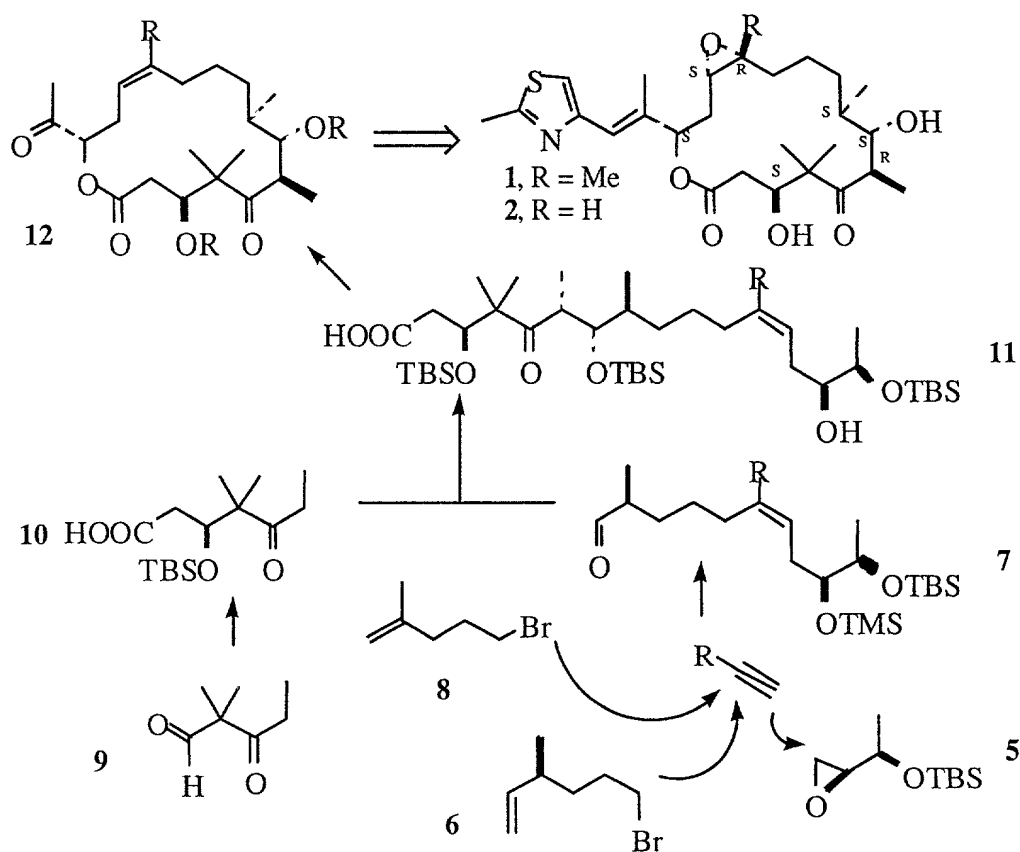


FIG. 2

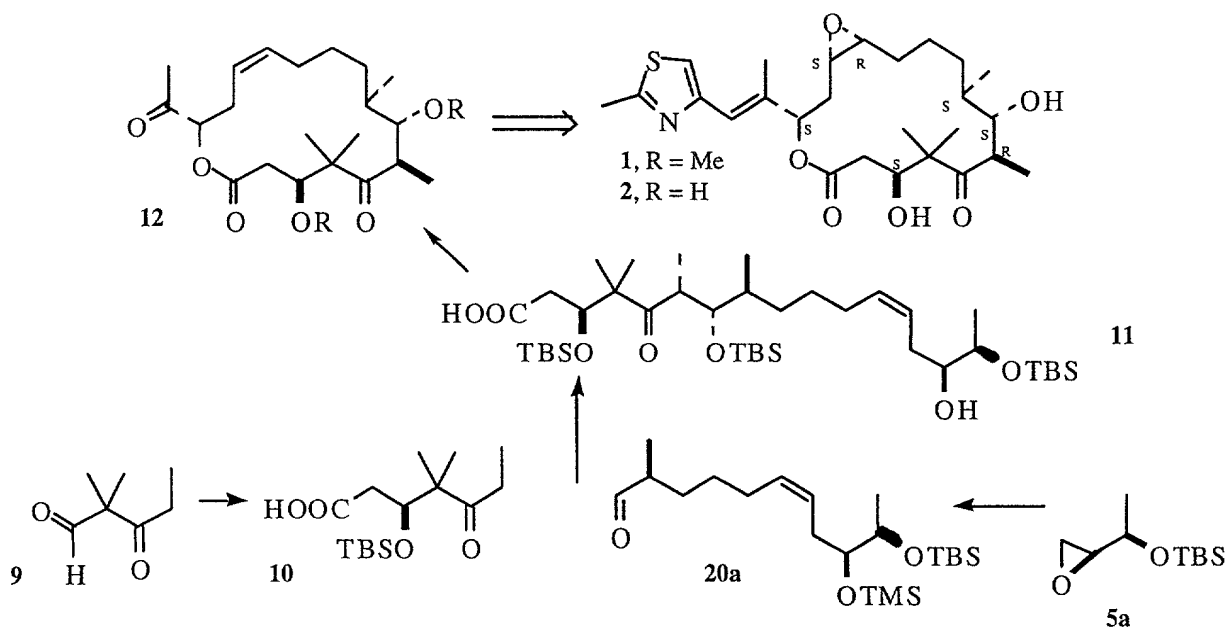
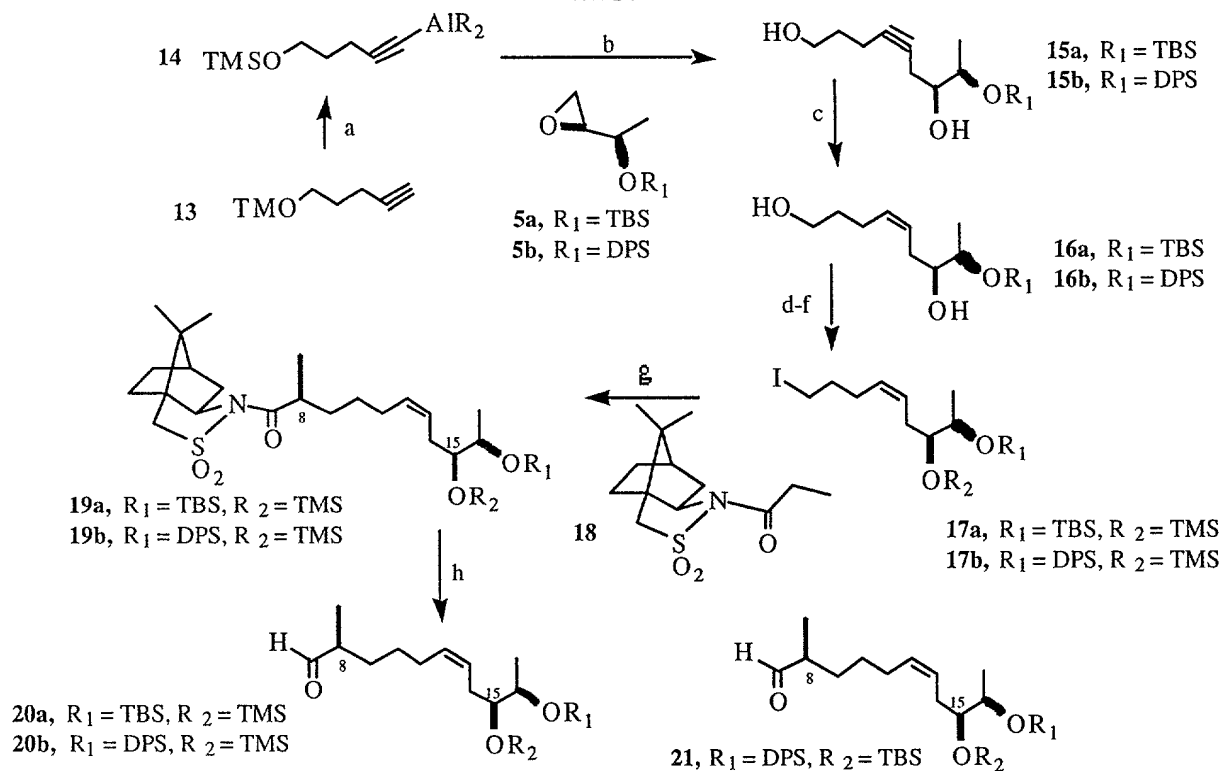
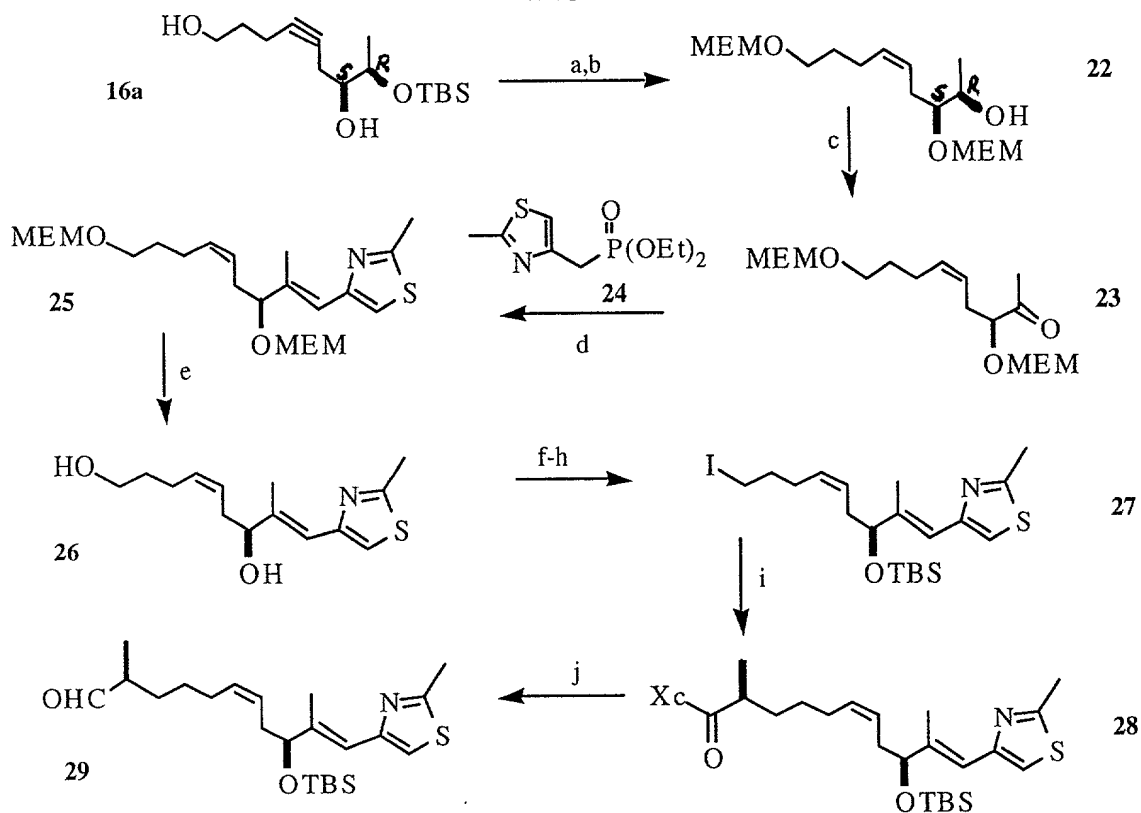


FIG. 3



Key: a) n-BuLi, Ether; Et₂AlCl, toluene; b) **5** then dil.HCl; c) Lindlar Catalyst, H₂; d) TsCl, THF, pyridine; e) TMStriflate, CH₂Cl₂, 2,6-Lutidine; f) NaI, acetone, Δ; g) N-Propionylcamphorsultam **18**, n-BuLi, then **17**; h) DIBAL, THF-CH₂Cl₂.

FIG. 4



Key: a) MEMCl, DIPA, CH₂Cl₂; b) TBAF, THF; c) Swern Oxidation; d) Horner-Emmons Reaction, LDA, THF, **24**; then ketone **23**; e) HCl, H₂O, THF; f) TsCl, pyridine, CH₂Cl₂; g) TBSOTf, DIPA; h) NaI, acetone, Δ; i) N-propionylcamphorsultam **18**, n-BuLi, then iodide; j) DIBALH, CH₂Cl₂.

FIG. 5

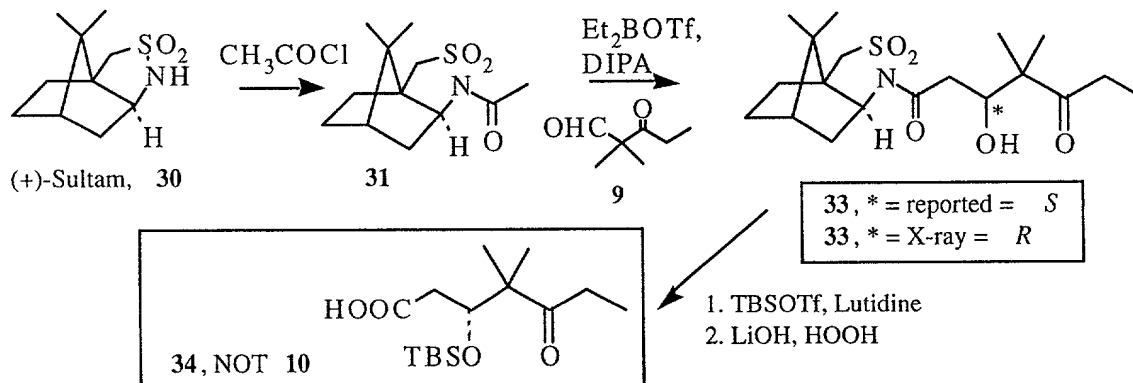


FIG. 5a

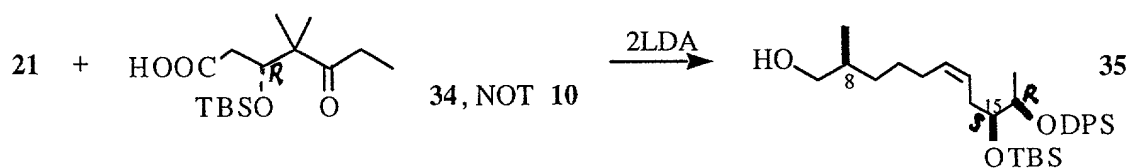


FIG. 6

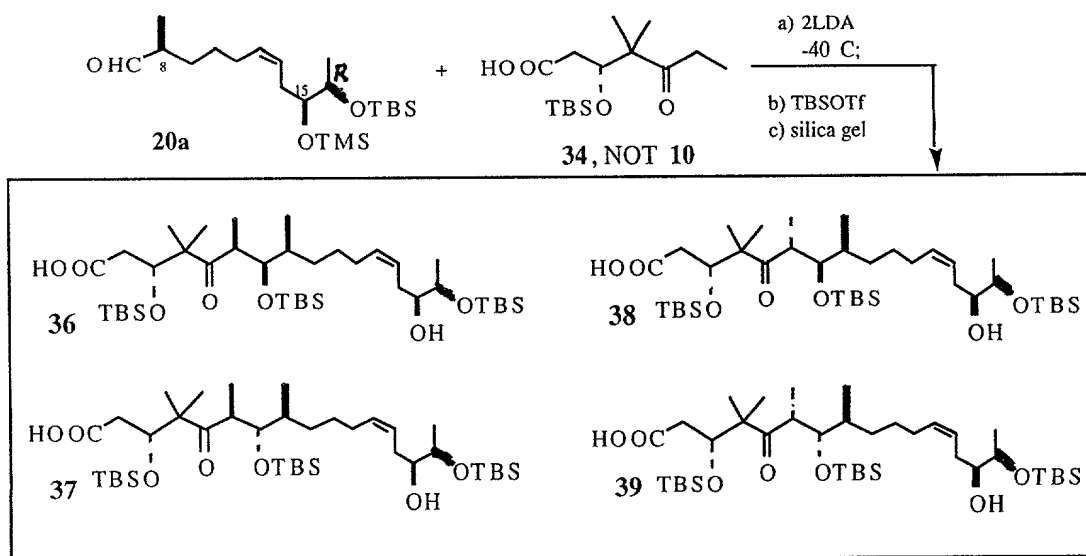
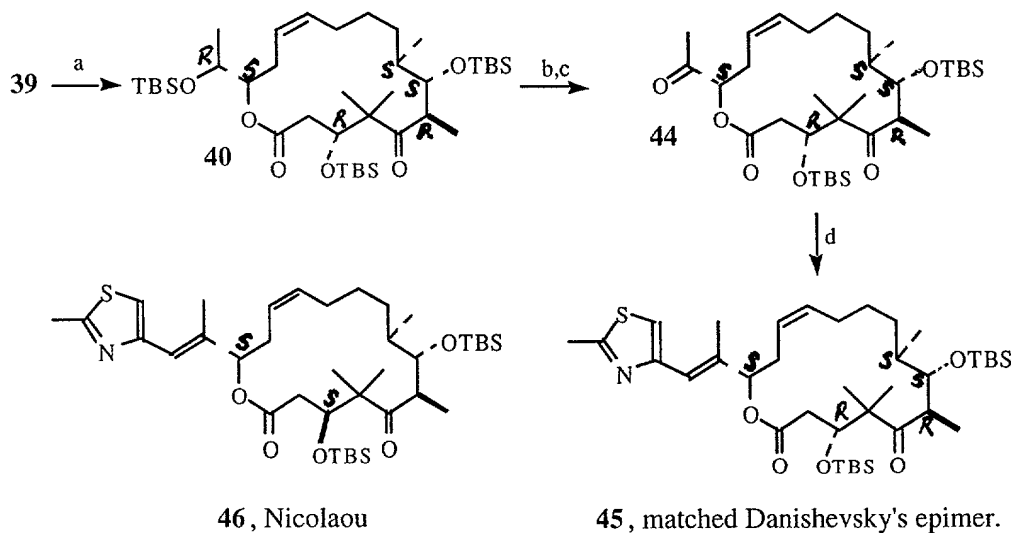


FIG. 7



Key: a) $\text{Cl}_3\text{C}_6\text{H}_2\text{COCl}$, pyridine, DMAP; b) TBAF, THF; c) PCC, CH_2Cl_2 ; d) Horner-Emmons: LDA, 24.

FIG. 8

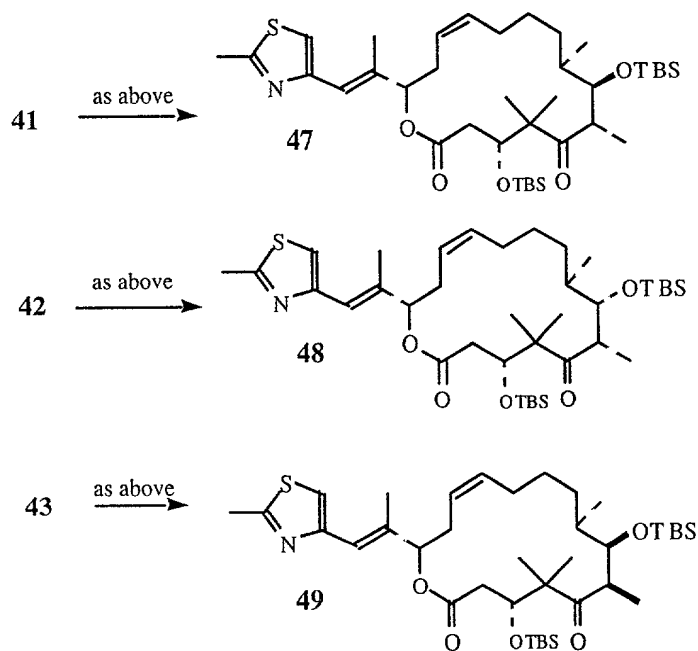


FIG. 9

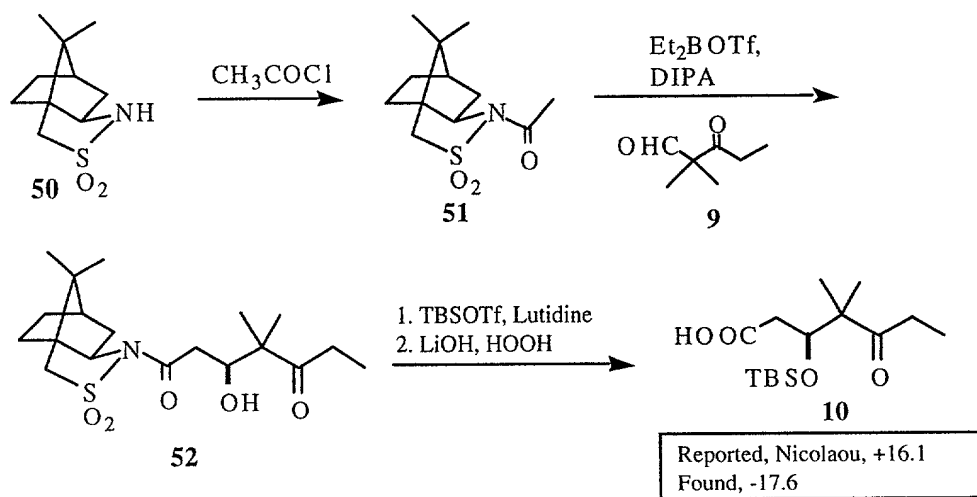


FIG. 10

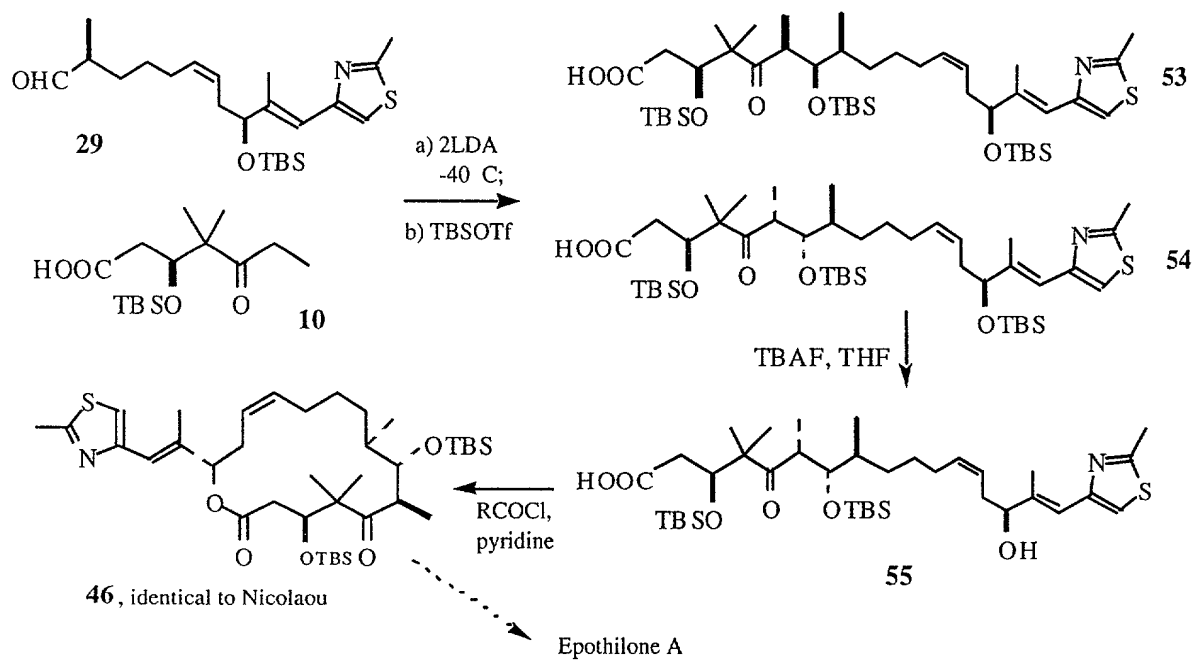
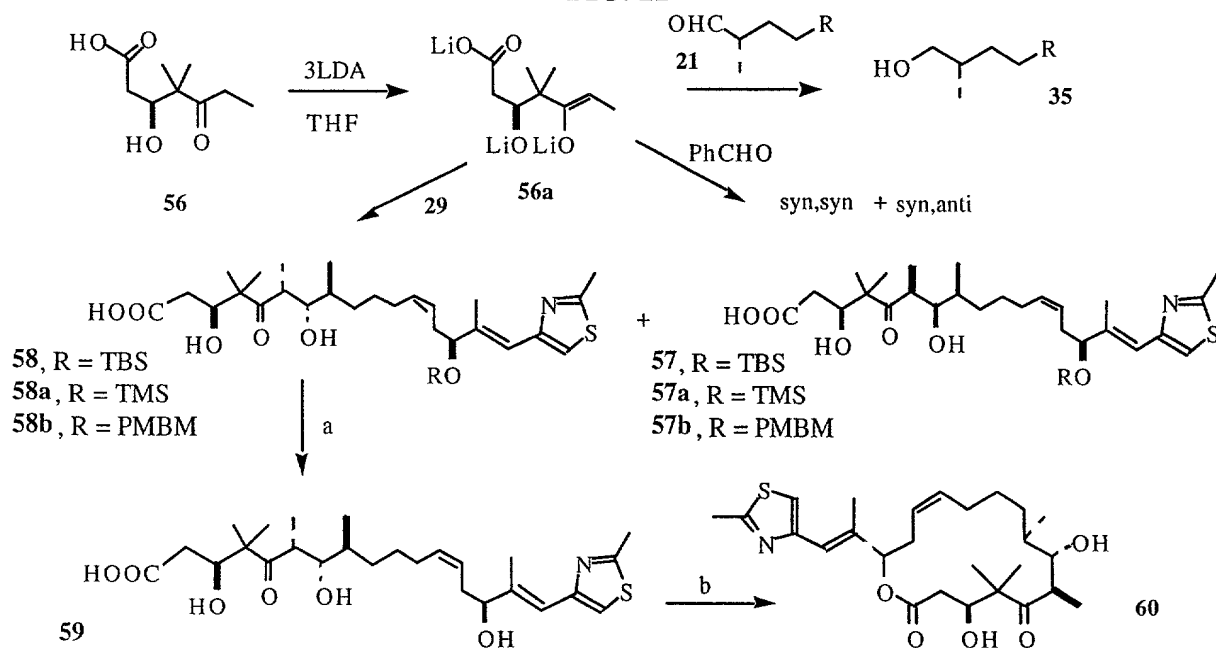
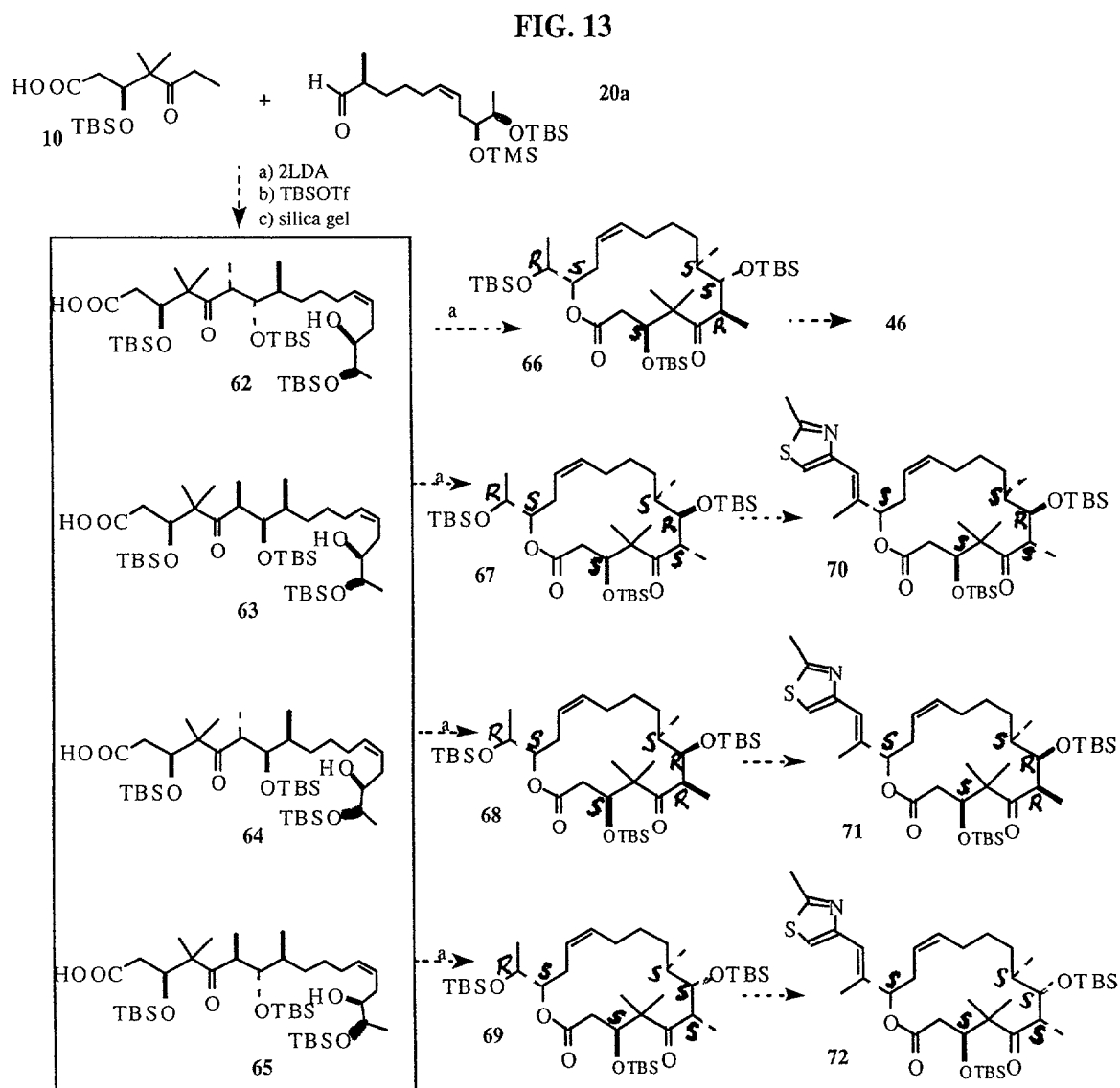
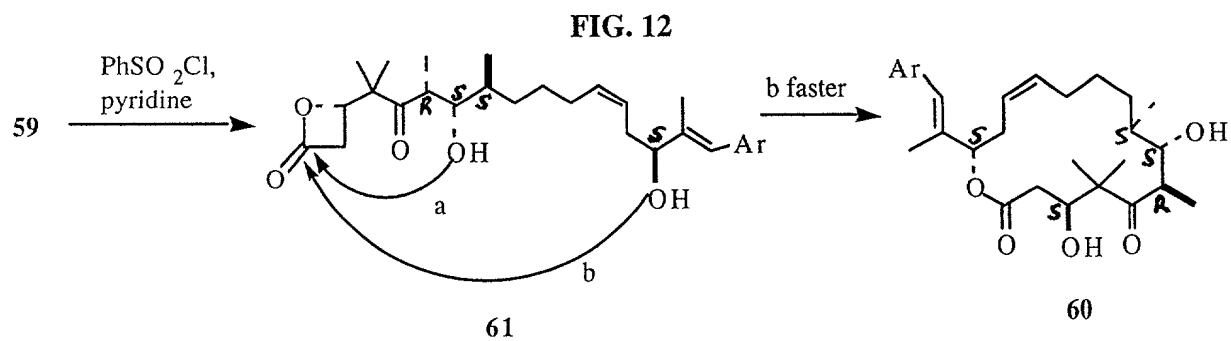


FIG. 11

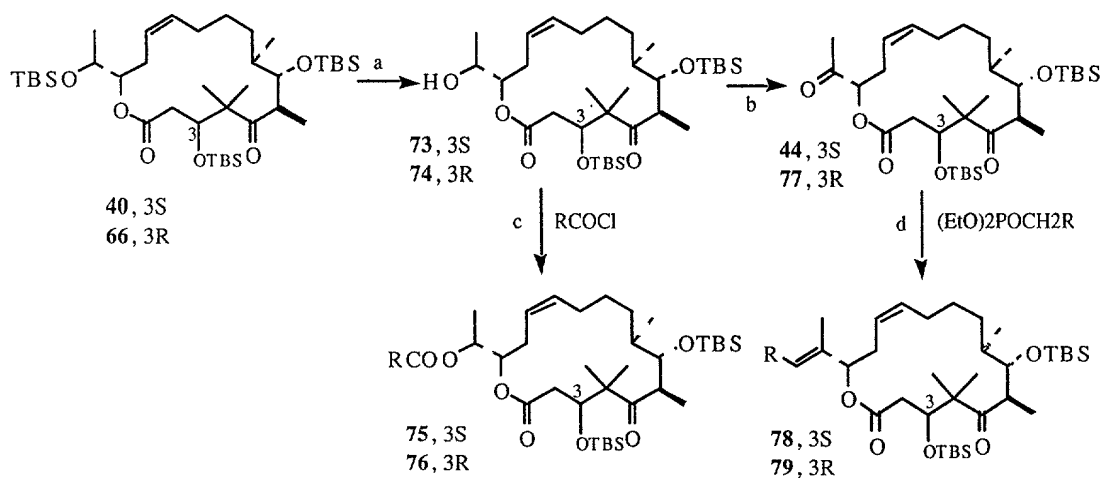


Key: a) **58**, TBAF, THF; **58a**, chromatography; **58b**, dil. acid or DDQ, CH₂Cl₂, water; b) PhSO₂Cl, pyridine, or Cl₃PhCOCl, pyridine, DMAP, CH₂Cl₂.



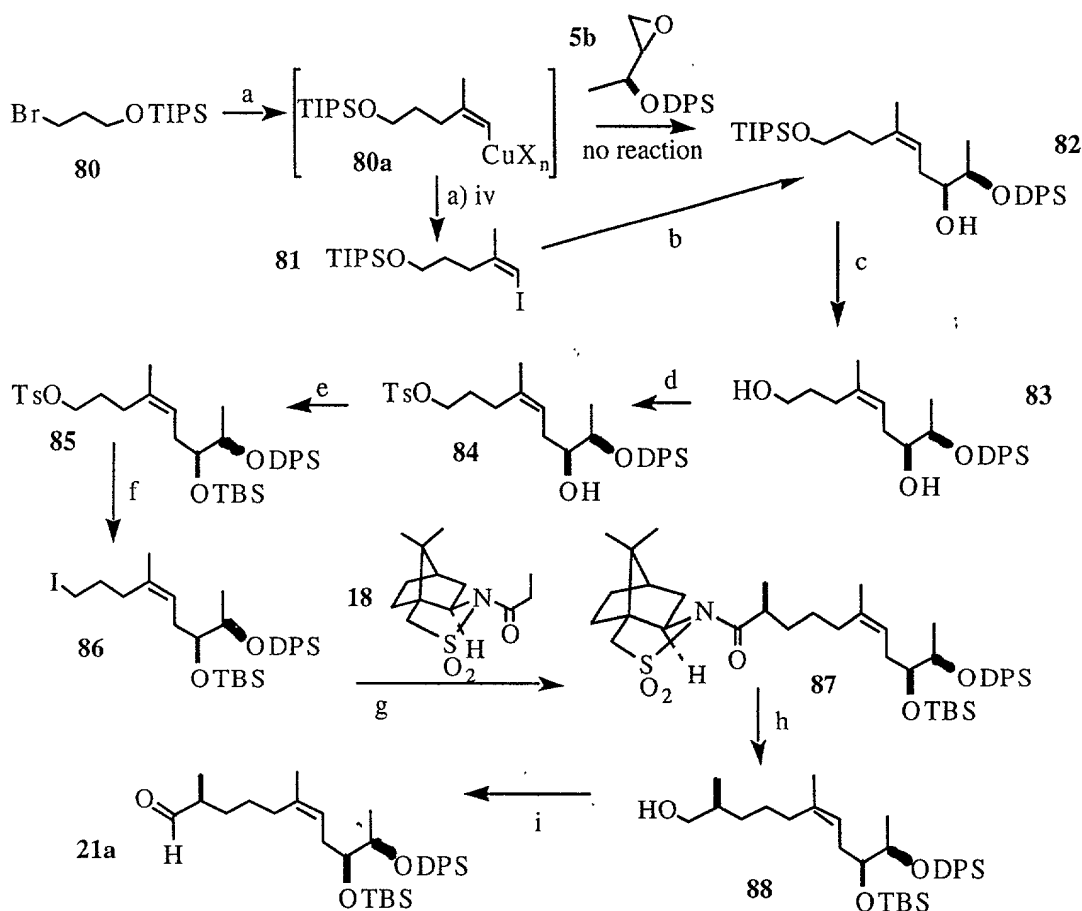
Key: a) as in Figure 7

FIG. 14



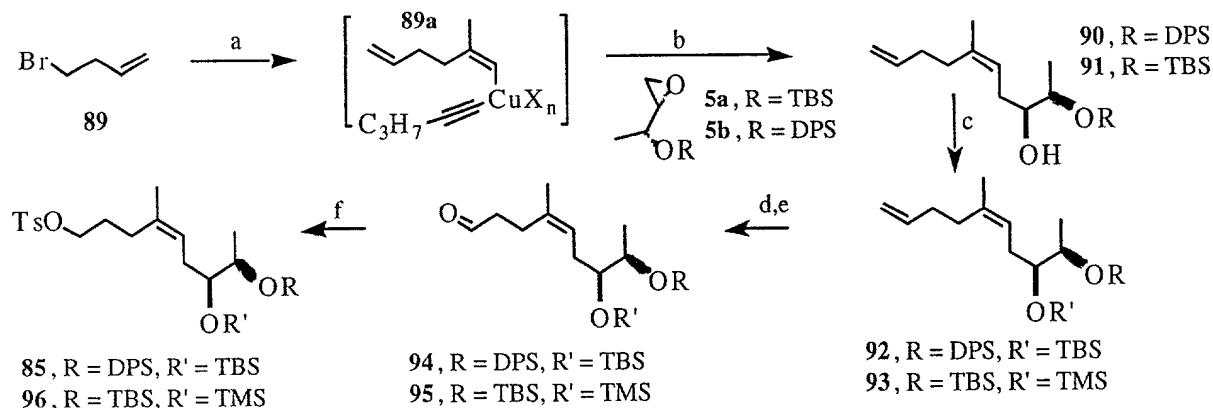
Key: a) 1.0 TBAF, THF; b) PCC, CH_2Cl_2 ; c) pyridine or DMAP, CH_2Cl_2 ; d) Horner-Emmons: LDA, 24 or other phosphonates.

FIG. 15



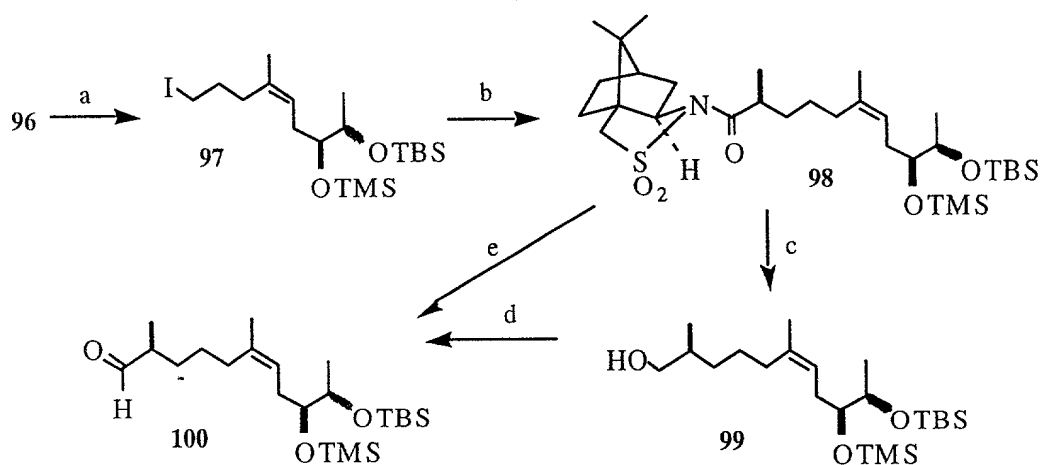
Key: a) i) Mg , ether; ii) $\text{CuBr} \cdot \text{DMS}$; iii) propyne; iv) I_2 ; b) i) n-BuLi ; ii) Me_2AlCl ; iii) 5b; c) HCl , EtOH ; d) TsCl , pyridine; e) TBSOTf , 2,6-lutidine, CH_2Cl_2 ; f) NaI , acetone; g) 18, n-BuLi , -40°C , THF; h) LiAlH_4 , THF; i) $\text{pyridine} \cdot \text{SO}_3$, CH_2Cl_2 ; Et_3N .

FIG. 16



Key: a) i) Mg, ether; ii) CuBr•DMS, DMS, ether; iii) propyne; iv) pentynyl lithium; b) **5b**, -40 °C, 36 hrs; c) TBSOTf, 2,6-lutidine, CH₂Cl₂; d) AD-mix a, e) NaIO₄, EtOH, HOH; f) NaBH₄, MeOH; g) TsCl, pyridine.

FIG. 17



Key: a) NaI, acetone; b) **18**, n-BuLi, -40 °C, THF; c) LiAlH₄, THF; d) pyridine•SO₃, CH₂Cl₂; Et₃N; e) DIBALH, ether, -78 °C.

FIG. 18

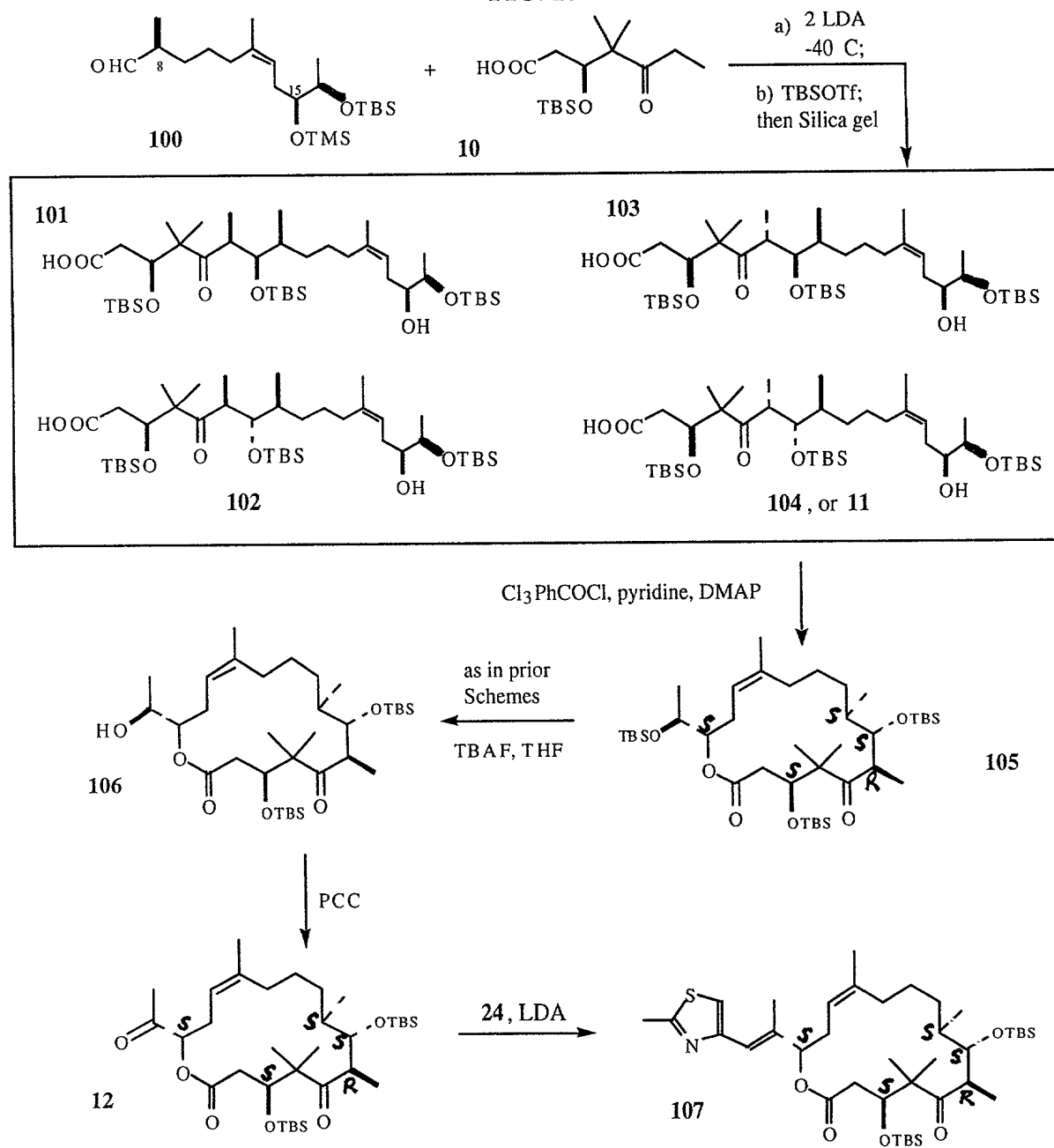
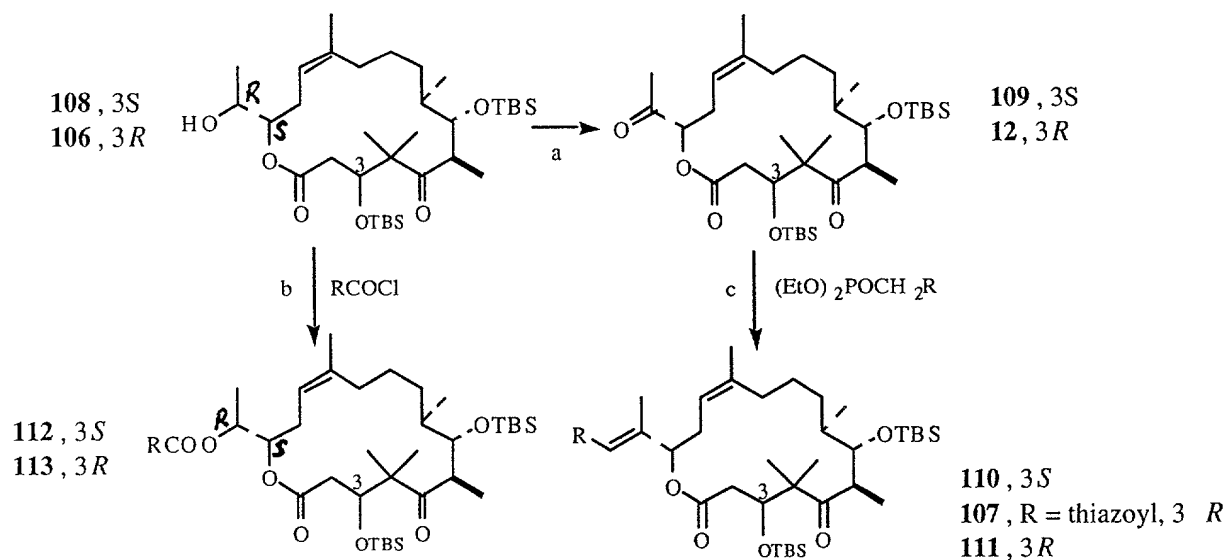
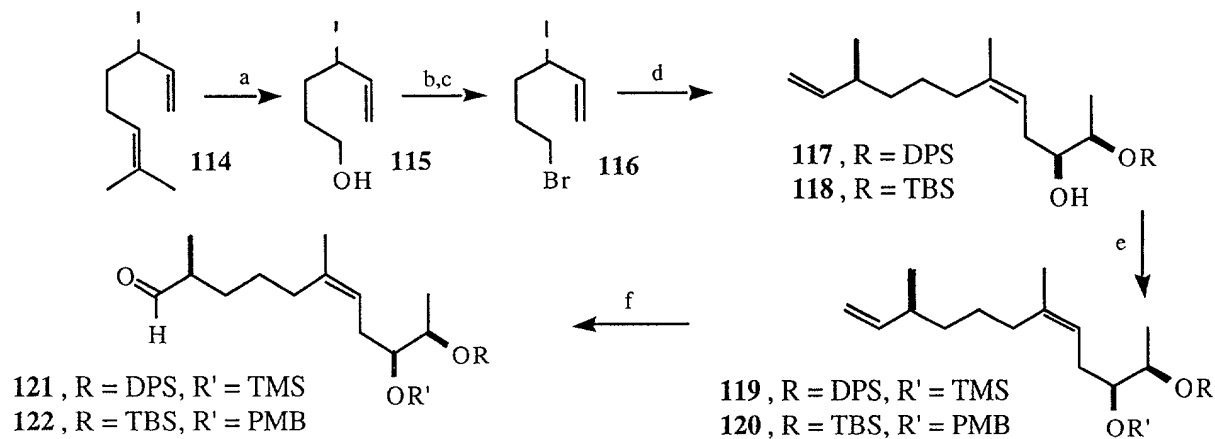


FIG. 19



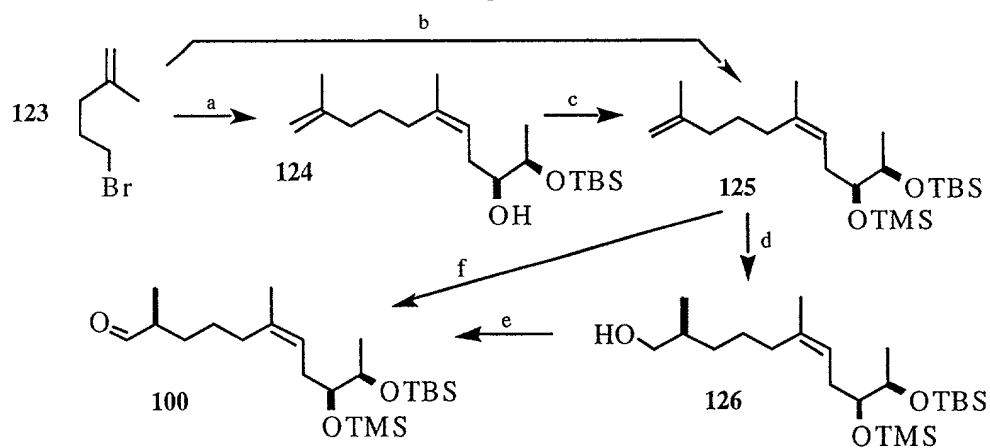
Key: a) PCC, CH_2Cl_2 ; b) pyridine or DMAP, CH_2Cl_2 ; c) Horner-Emmons: LDA, **24** or other phosphonates.

FIG. 20



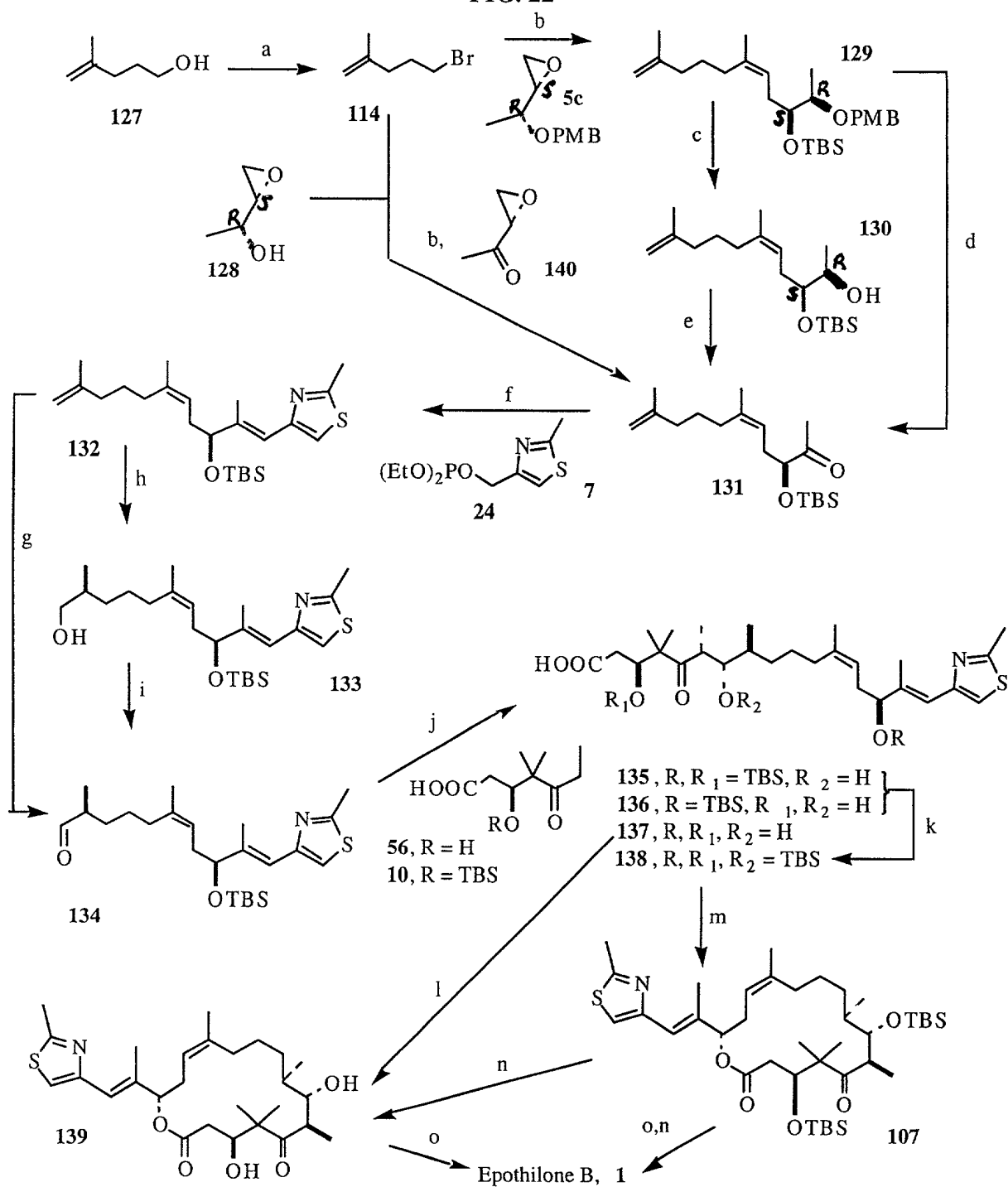
Key: a) O_3 , MeOH, $-78\text{ }^\circ\text{C}$; then NaBH_4 ; b) TsCl, pyridine; c) LiBr, acetone; d] i) Mg, ether; ii) $\text{CuBr}\cdot\text{DMS}$, DMS, ether; iii) propyne; iv) pentynyl lithium; v) **5a** or **5b**, $-40\text{ }^\circ\text{C}$, 36 hrs; e) TMSOTf, 2,6-lutidine, CH_2Cl_2 ; or p- $\text{MeOC}_6\text{H}_4\text{CH}_2\text{Br}$, NaH, DMF; f) ADMix a; then NaIO_4 .

FIG. 21



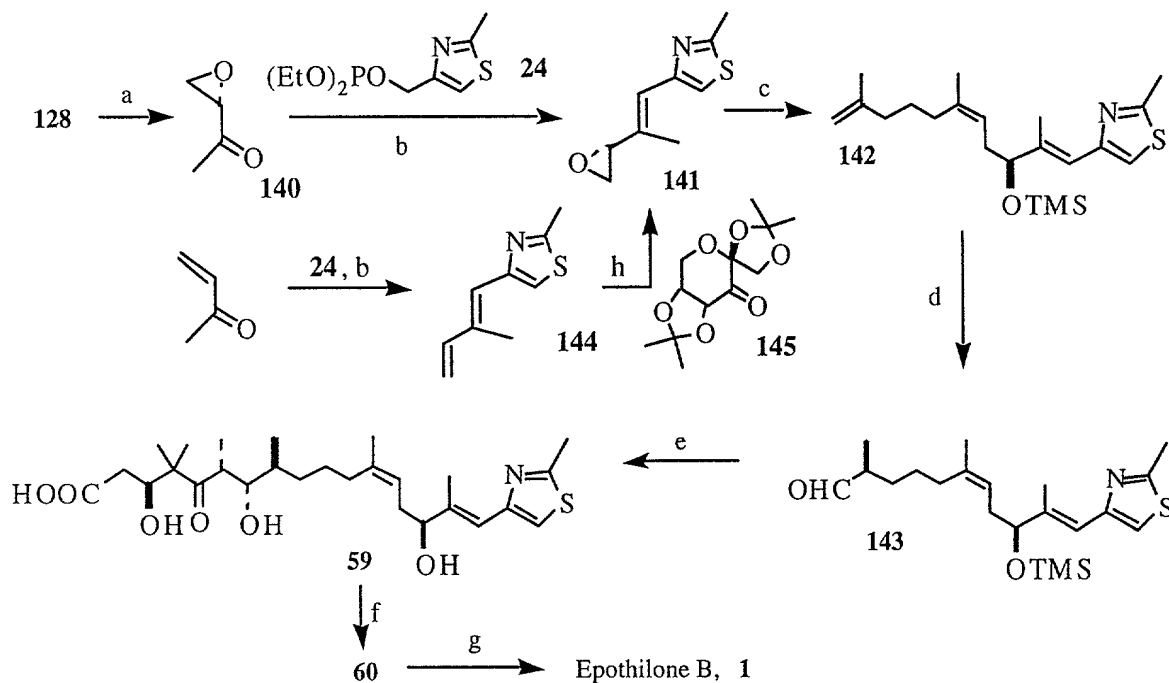
Key: a) i) Mg, ether; ii) CuBr•DMS, DMS, ether; iii) propyne; iv) pentynyl lithium; v) **5a**, -40 °C, 36 hrs; b) i) Mg, ether; ii) CuBr•DMS, DMS, ether; iii) propyne; iv) pentynyl lithium; v) **5a**, -40 °C, 36 hrs; vi) TMSOTf, -78 °C; c) TMSOTf, 2,6-lutidine, CH₂Cl₂; d) (ipc)2BH, THF, -20 °C; then H₂O₂, NaOH; e) pyr•SO₃, DMSO, Et₃N, CH₂Cl₂; f) (ipc)2BH, THF, -20 °C; then PCC, CH₂Cl₂.

FIG. 22



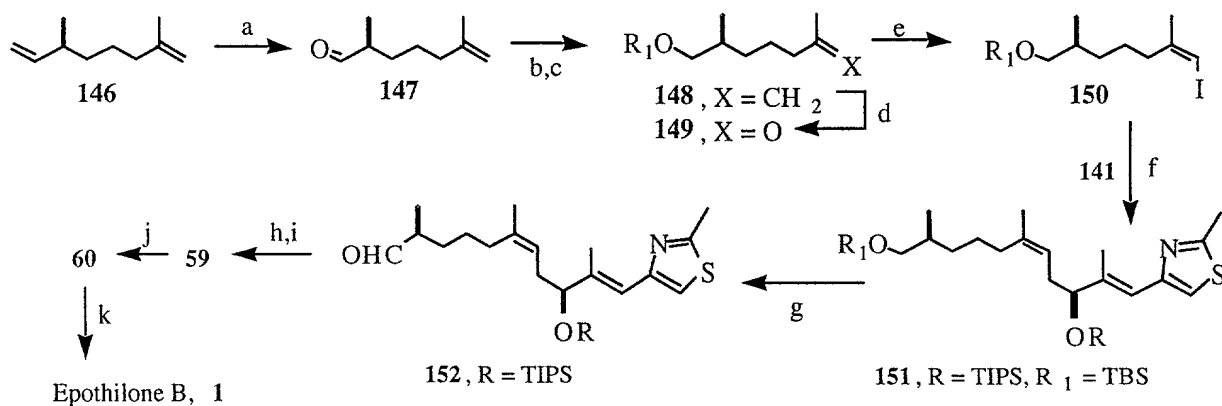
Key: a) PBr_3 ; b) Mg, ether; then propyne, Cu(I); pentynyl lithium; then epoxide 4; then TBSCl; c) DDQ; d) Jones Oxidation; e) Swern Oxidation; f) Horner-Emmons reaction with 7; g) $(\text{Ipc})_2\text{BH}$, THF; then PCC; h) $(\text{Ipc})_2\text{BH}$, THF; then HOONa ; i) Pyridine $\cdot\text{SO}_3$, Et_3N , CH_2Cl_2 ; j) slight excess LDA, THF, -40°C ; k) TBSOTf, 2,6-lutidine, CH_2Cl_2 ; l) PhSO_2Cl , pyridine; m) $\text{Cl}_3\text{C}_6\text{H}_2\text{COCl}$, pyridine, DMAP; n) TBAF, THF; o) Dimethyldioxirane, acetone.

FIG. 23

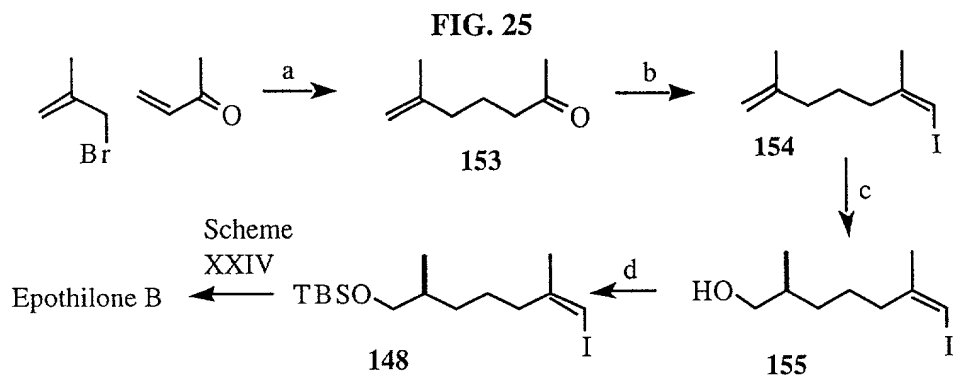


Key: a) Cr(VI), or pyridine \cdot SO₃, DMSO, Et₃N, CH₂Cl₂; b) LDA, 24, then 140; c] i) 123, Mg, ether; ii) CuBr \cdot DMS, DMS, ether; iii) propyne; iv) pentynyl lithium; v) 141, -40 °C, 36 hrs; vi) TMSOTf, -78 °C; d) (ipc)₂BH; then Cr(VI); e) 56a, THF, -78 °C; then silica gel; f) PhSO₂Cl, pyridine, CH₂Cl₂; g) dimethyldioxirane, acetone; h) chiral ketone 145, oxone, pH 7-8, aq. CH₃CN (Y. Shi, et al., J. Org. Chem., 63(23), 8475 (1998)).

FIG. 24



Key: a) AD-mix; then NaIO₄; b) NaBH₄, MeOH; c) TBSCl, pyridine, CH₂Cl₂; d) O₃, CH₂Cl₂; Me₂S; e) Ph₃P=CH-I, THF; f) *t*-BuLi, then Et₂AlCl, then 141, then TIPSCl; g) Quinolinium fluorochromate, CH₂Cl₂; h) 56a, THF, -78 °C; i) HF \cdot pyr, CH₃CN; j) PhSO₂Cl, pyridine, CH₂Cl₂; k) dimethyldioxirane, acetone.



Key: a) Zn/Cu, sonochem; b) Ph₃P=CH-I, THF; c) (Ipc)₂BH; then NaBO₃; d) TBSCl, pyr, CH₂Cl₂.

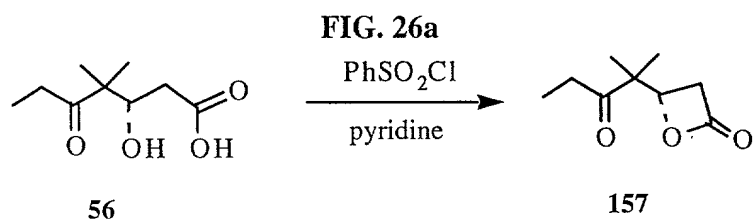
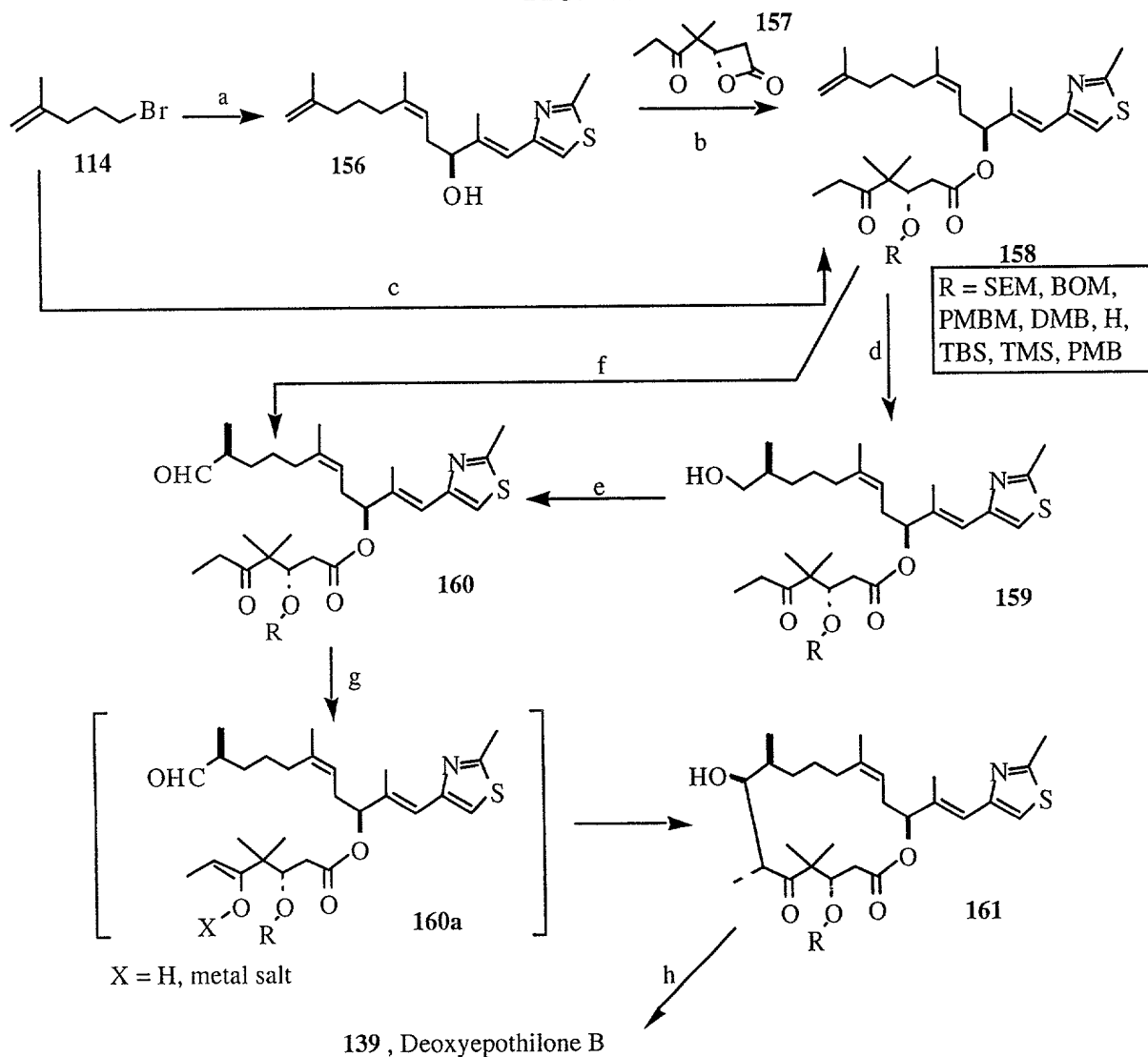
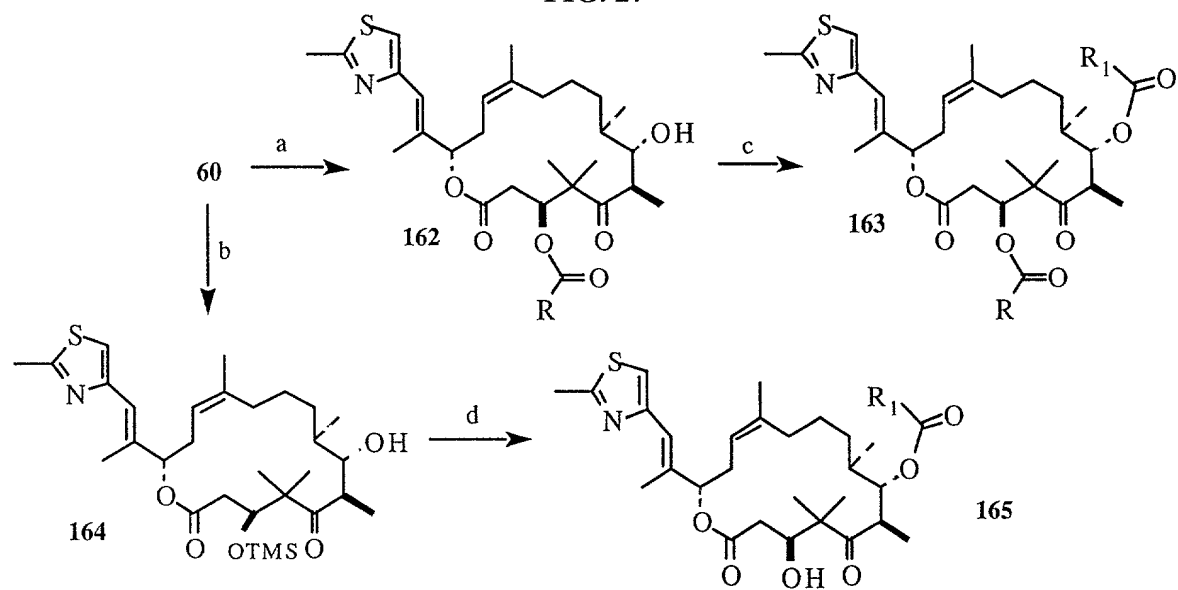


FIG. 26b



Key: a) Mg, ether; then propyne, Cu(I); pentynyl lithium; epoxide **143** (Scheme XXIII); then H_3O^+ ; b) β -lactone **157** (Scheme XXIII), pyridine, CH_2Cl_2 ; c) Mg, ether; then propyne, Cu(I); pentynyl lithium; β -lactone **157** (Scheme XXIII); then $p\text{-MeOC}_6\text{H}_4\text{CH}_2\text{OCH}_2\text{Cl}$ or other protecting group such as TBSOTf or TBSCl; d) $(\text{Ipc})_2\text{BH}$, THF; then LiOOH ; e) Swern Oxidation; f) $(\text{Ipc})_2\text{BH}$, THF; then PCC; g) Lewis or protic acid; or alternatively base catalyzed cyclization; h) DDQ, CH_2Cl_2 , HOH, buffer to remove the PMB, PMBM or DMB groups; Fluoride ion to remove Si based groups.

FIG. 27



Key: a) RCOX, pyridine, catalytic DMAP, CH_2Cl_2 ; b) TMSOTf, 2,6-lutidine, CH_2Cl_2 ; c) R₁COX, DMAP, CH_2Cl_2 ; d) R₁COX, DMAP, CH_2Cl_2 ; then silica gel. Where RCOX = active ester of usual variety.

FIG. 28

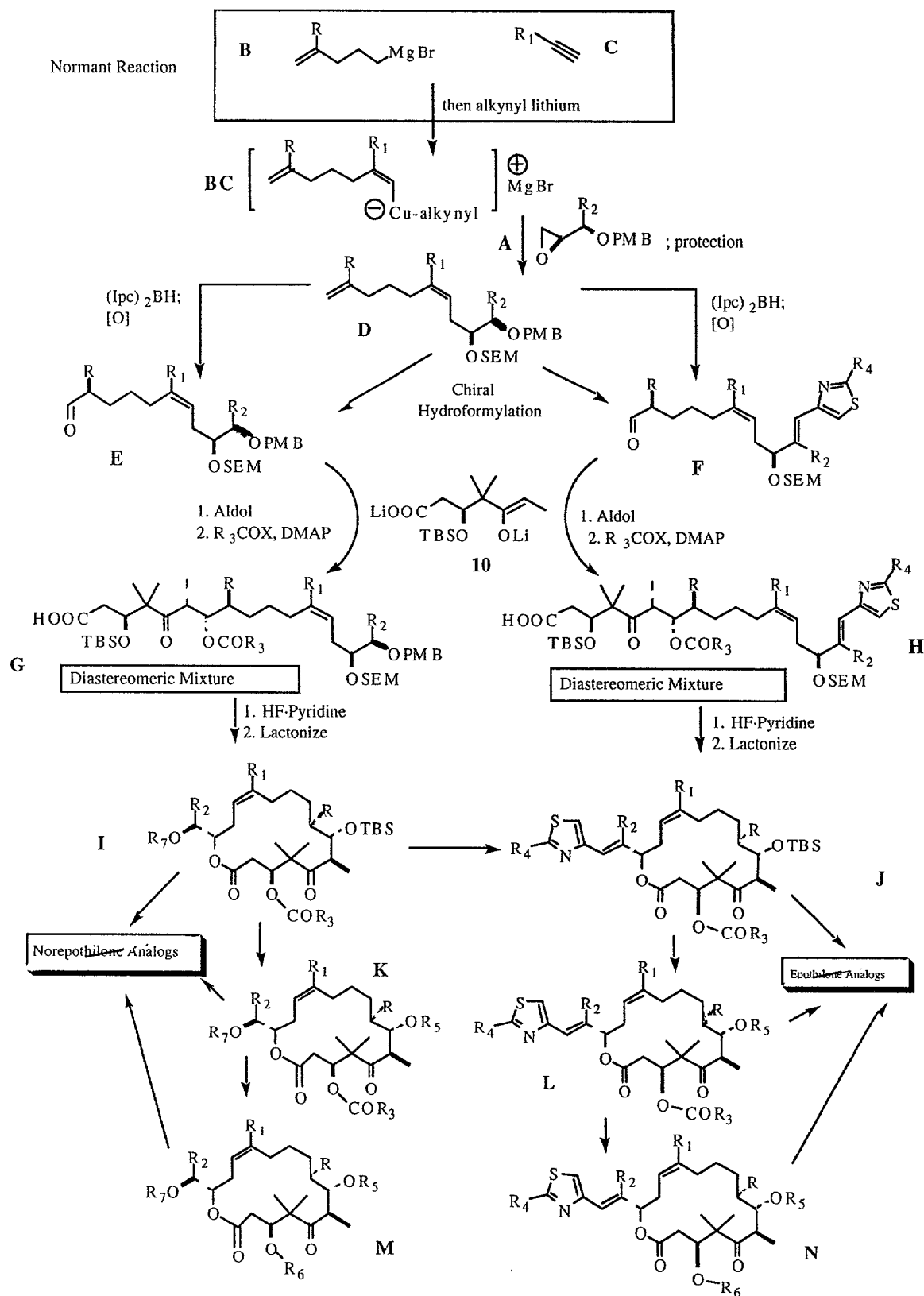
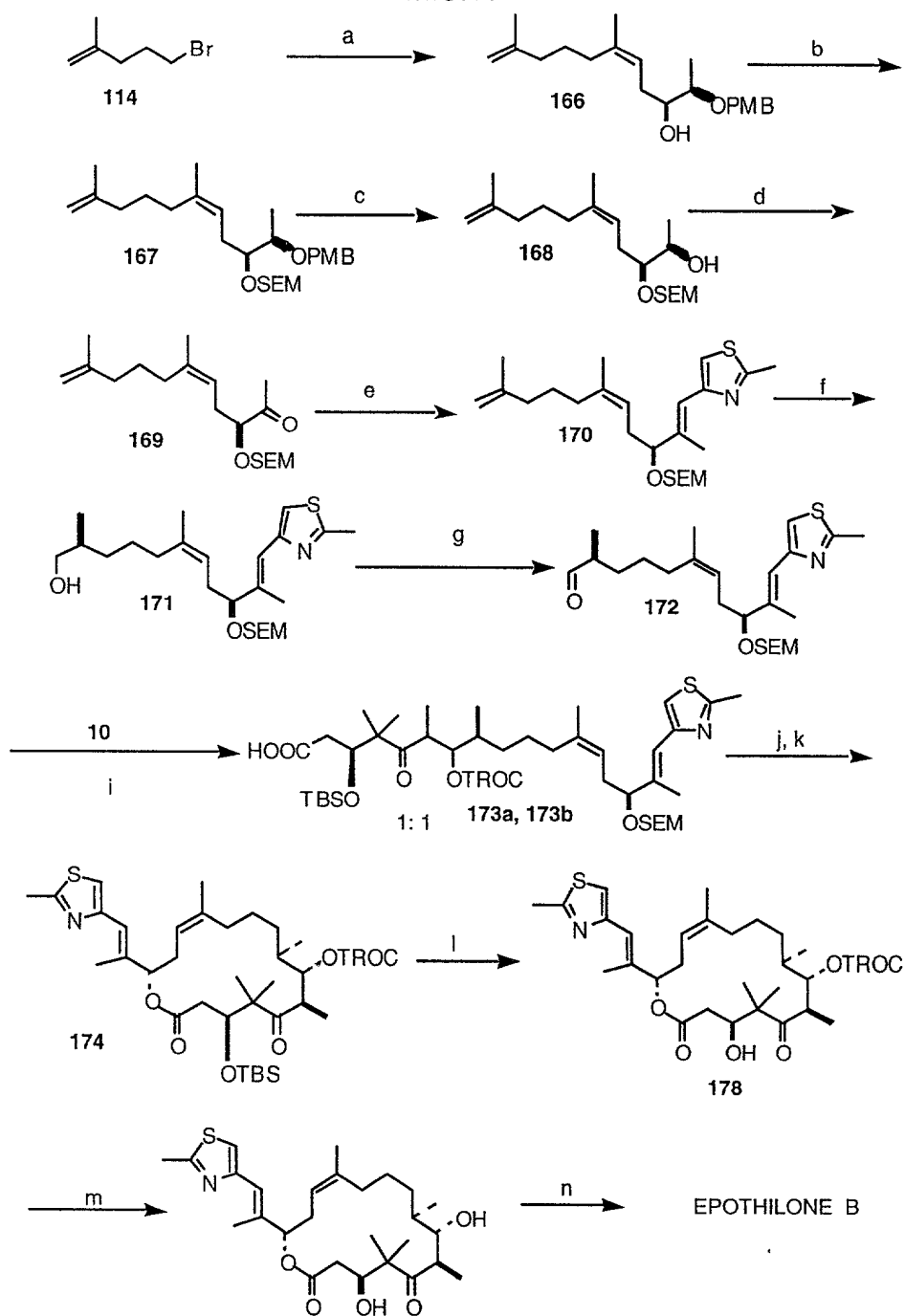
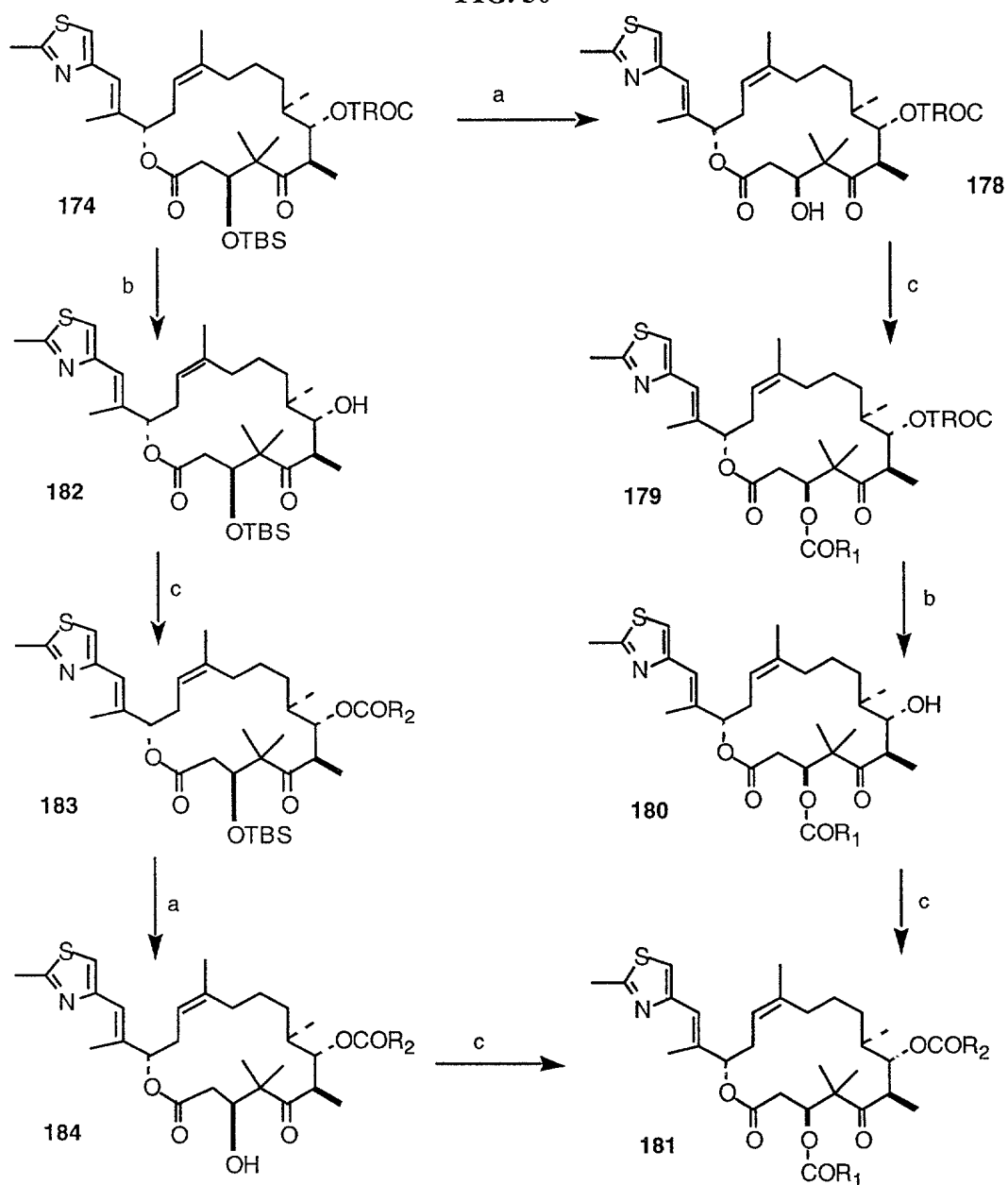


FIG. 29



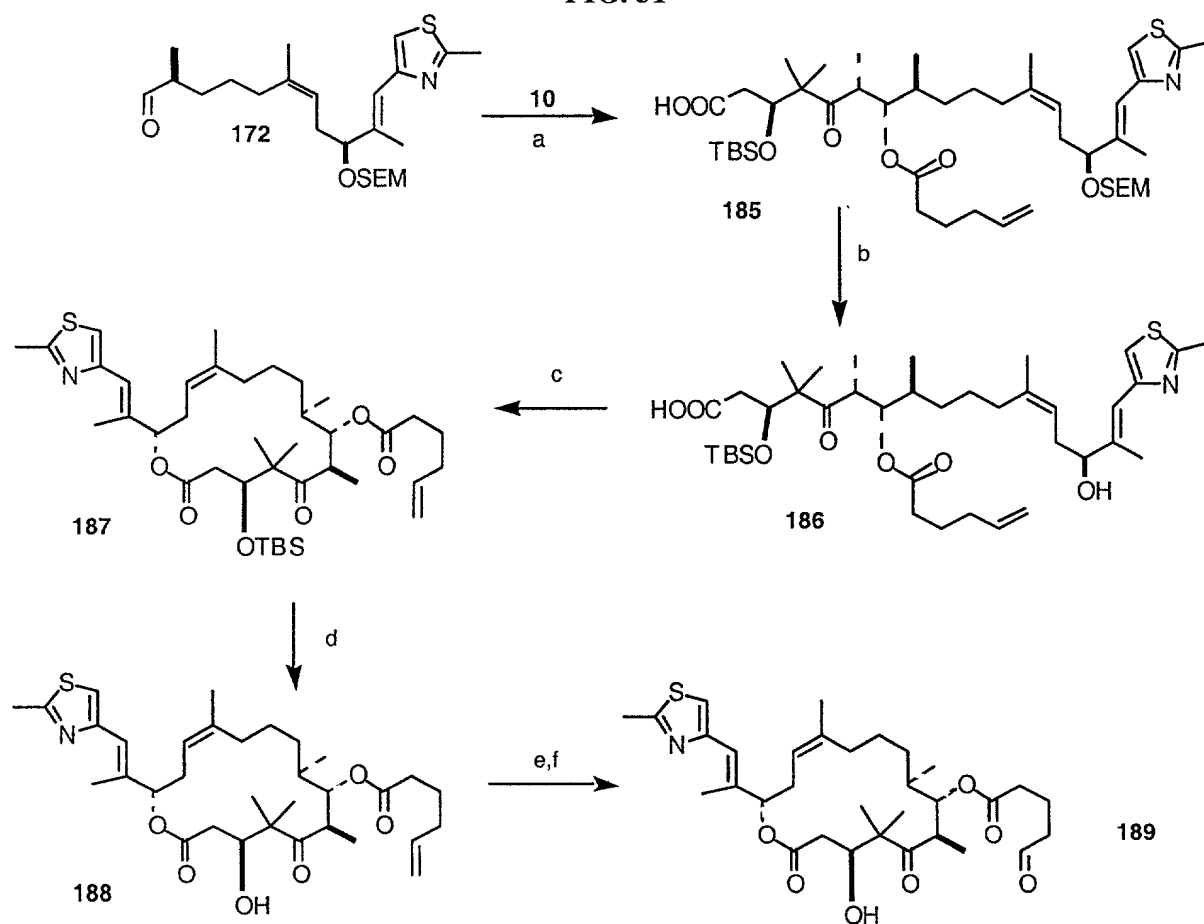
Key: a) i. Mg, ether; ii. CuBr•DMS complex, ether, DMS, -45°C; iii. propyne, -23°C; iv. Li-hexyne, HMPA, -78°C; v. **5c**, -78°C to -25°C, 78%; b) SEM-Cl, DIPEA, CH₂Cl₂, 94%; c) DDQ, CH₂Cl₂, HOH; 85%; d) SO₃•pyr, TEA, CH₂Cl₂; 78%; e) **24**, n-BuLi, THF, -78°C to R.T., 85%; f) (Ipc)₂BH, THF; H₂O₂, 82%; g) oxalyl chloride, DMSO, TEA, CH₂Cl₂, 88%; h) LDA, -78°C to -40°C, ZnCl₂; -78°C to -50°C, THF, 68%; i) TROC-Cl, DMAP, CH₂Cl₂, j) TFA, CH₂Cl₂, k) Trichlorobenzoyl chloride, TEA, THF, DMAP, toluene; l) HF•pyridine; m) Zn, HOAc; n) m-CPBA, CH₂Cl₂.

FIG. 30



Key: a) HF•pyridine, THF; b) Zn, HOAc; c) RCOOH, DCC, TEA, DCM.

FIG. 31



Key: a) LDA, -78°C to -40°C , ZnCl_2 ; -78°C to -50°C , THF, 68%; then $\text{CH}_2=\text{CH}(\text{CH}_2)_3\text{COCl}$, DMAP, CH_2Cl_2 , b) TFA, CH_2Cl_2 , c) Trichlorobenzoyl chloride, TEA, THF, DMAP, toluene; d) $\text{HF}\cdot\text{pyridine}$; e) vicinal dihydroxylation; f) NaIO_4 , THF, HOH.

FIG. 32

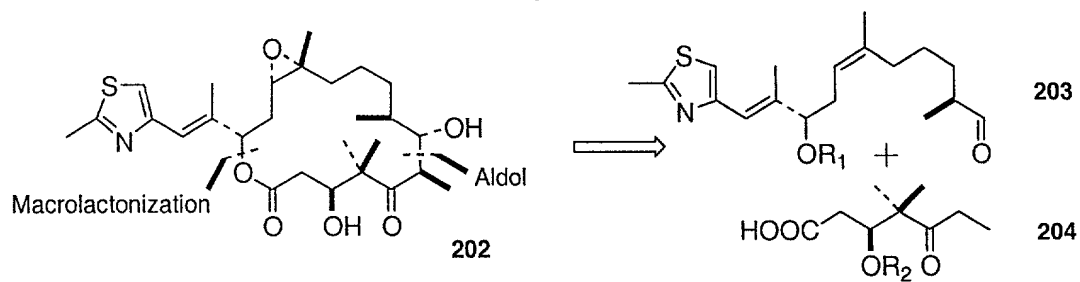


FIG. 33

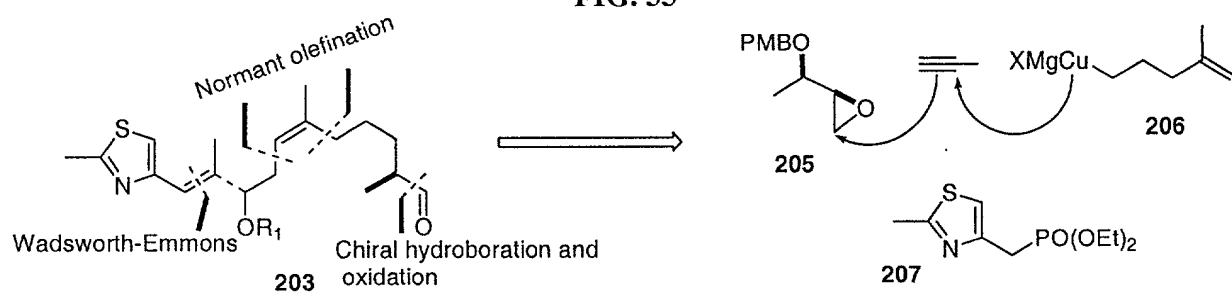
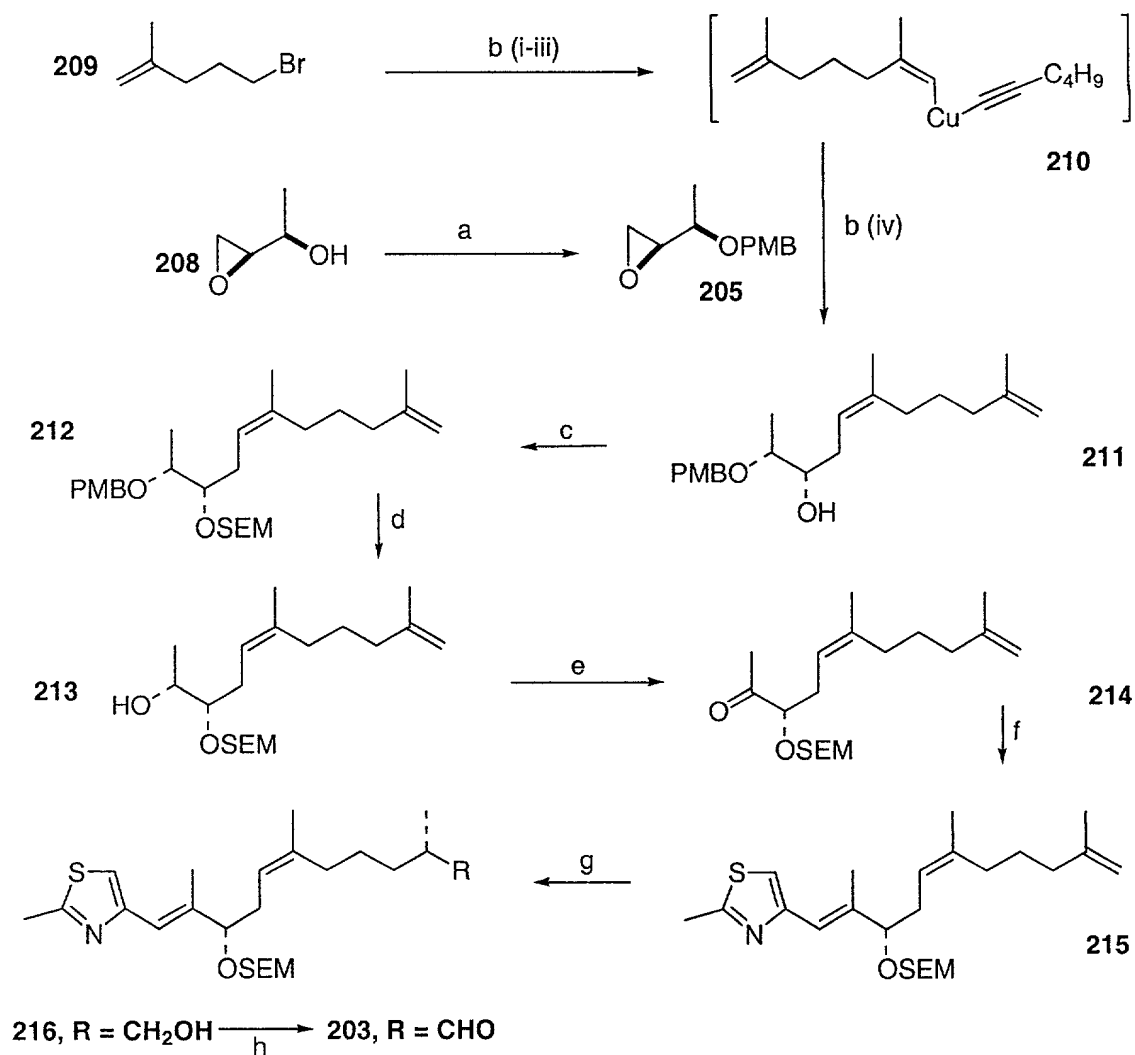
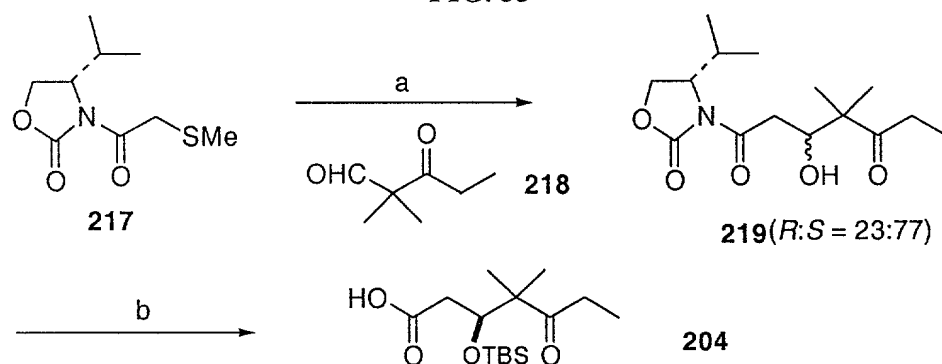


FIG. 34



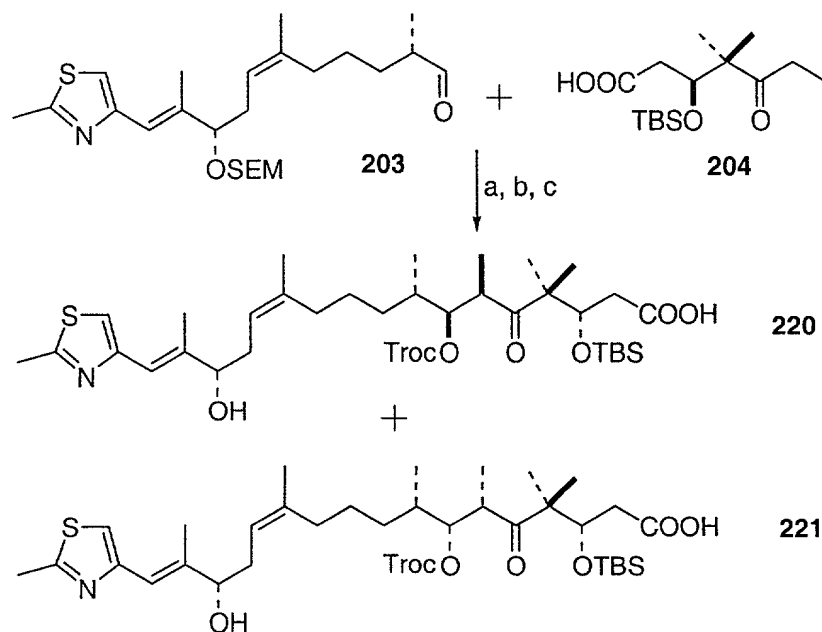
Key: a) PMB-Br, NaH, $\text{Bu}_4\text{N-I}$, THF, 0°C , 85%; b) i) Mg, ether, rt; ii) CuBr-DMS, ether, DMS, -45°C , 3h, iii) Propyne, -45°C to -23°C , 4h then lithiohexyne, -78°C , 1h; iv) epoxide 205, -78°C , 1h, -25°C , 24h, 76%; c) SEMCl, DIPEA, DCM, 0°C , 92%; d) DDQ, DCM:water (8:2), 88%; e) DMSO, $(\text{COCl})_2$, DCM, TEA, -78°C , 85%; f) 207, $n\text{-BuLi}$, THF, then 214, 72%; g) $(i\text{-PC})_2\text{BH}$, THF, 0.5h, aq. NaBO_3 ; and h) DMSO, $(\text{COCl})_2$, DCM, TEA, -78°C , 92%.

FIG. 35



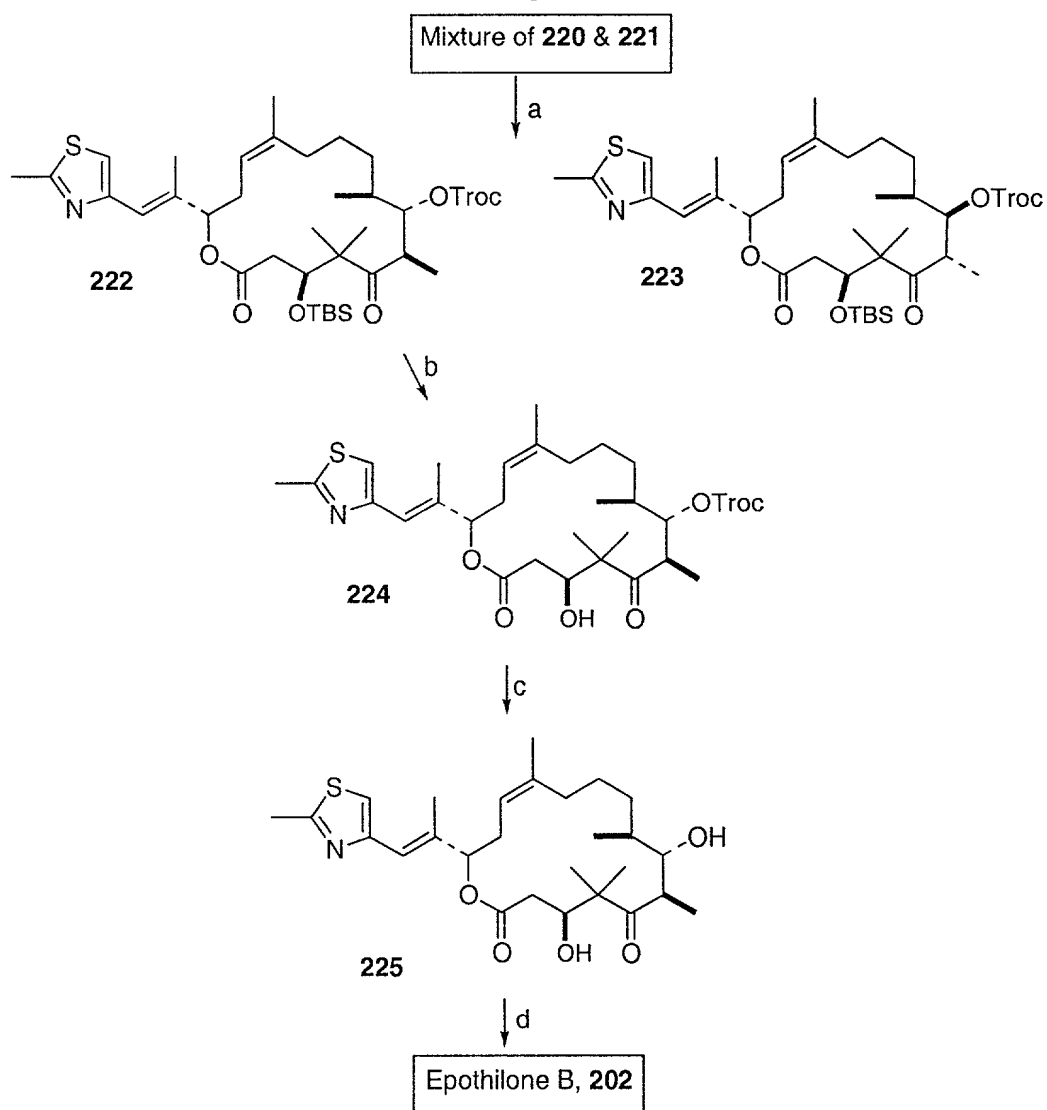
Key: (a) (i) Bu₂BOTf, DIPEA, CH₂Cl₂, 0 °C then add **217** at -78 °C; (ii) Raney Ni, acetone, 60 °C, 45 min, 70% combined; (b) (i) TBDMSOTf, 2,6-lutidine, CH₂Cl₂, 0 °C to rt, 95%; (ii) LiOH, H₂O₂, THF-H₂O, rt, 82%.

FIG. 36



Key: a) LDA, **204**, THF, -78 °C to -40 °C then to -78 °C, ZnCl₂, **203**, -78 °C to -50 °C, 0.5 h; b) TrocCl, Py, DCM, 0 °C; c) TFA, DCM (3:7), -20 °C, 1 h, 63% (three steps).

FIG. 37



Key: (a) 2,4,6-Cl₃C₆H₂COCl, TEA, THF, DMAP, toluene, rt, 1h; b) HF-Py, DCM, rt, 95%;
c) Zn, aq. NH₄Cl, MeOH, reflux, 92%; d) [Methyl(trifluoromethyl)]dioxirane, MeCN, 0 °C, 56%.